MONAZITE IN THE BEACH SANDS OF VIZAGAPATAM DISTRICT

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Received January 26, 1948

Introduction

The study of the beach sands of the eastern coast is a neglected aspect of Indian Geology. In view of the potential economic importance of this subject and its academic value, a study of the beach sands of Vizagapatam, Waltair and environs from Rushikonda in the north to Yarada village in the south has been taken up by us. In recent years, monazite has attained both strategic and industrial importance and the potentialities of this mineral in India require to be carefully scrutinized. The only reference to this subject is in a publication, by Tipper (1914) where he casually mentions the reported occurrence of the mineral on the coast at Waltair and Bhimilipatam by Kemp and Cross respectively. Occurrence of monazite in all the samples now investigated by the authors is a most significant result and this paper deals mainly with that aspect of the problem.

Description of the Vizagapatam Beach

The Vizagapatam beach which runs roughly N.E.-S.W. having a width of 50′ to 300′ is situated between latitudes 17° 39′ and 70° 45′ and longitudes 83° 16′ 50″ and 83° 21′ 30″. The coastal area presents a hilly and rugged topography, with numerous bad lands and sand dunes. The important hills that form conspicuous landmarks in this area are the Simhachalem range to the north and Yarada hills to the south. These hills are composed mainly of khondalites and leptynites, into which are intruded pegmatites, charnockites and granites. It may be mentioned that the geology of the Vizagapatam district bears a close resemblance to that of Travancore (Tipper, 1914, *loc. cit.*, p. 186) where monazite sands occur in profusion as beach concentrates along with ilmenite, sillimanite, garnet, zircon, etc. These geological formations, on disintegration and decomposition, contribute the loose talus material to the red loams of Waltair highlands and in part to the beach sands. A tidal basin spreads out to the west of the town through a connecting channel fringing the northern slope of the Yarada hill. The channel forms the present harbour. A good part of the salty marsh of this tidal basin is reclaimed. The bad lands of Waltair are cut by many rivulets from the hills which fall into the Bay of Bengal. Chief among them are the Ootagedda stream between Waltair and Vizagapatam and Hanumanthavaka gedda to the north of Waltair and they transport the major part of the detrital sediment from the hills to the sea during the rainy season. The ill sorted red loam thus carried by the rivulets to the sea is thoroughly washed free of the clay material by the waves and carried to the deeper parts of the sea. Coarser particles like quartz, and other heavy minerals are deposited as sand along the beach, where through wave action they are further sorted according to their specific gravities and sizes. The black sands containing heavy minerals are found concentrated in patches by wave action over the predominantly quartz sands of the beach. It is also known from the investigations of the Vizagapatam harbour authorities that the currents bring up, from south to north, vast quantities of sands. Thus the beach sands not only represent the detrital material brought from interior by the streams but also those pushed up gradually from the southern coastal areas by currents. It is apparent from this fact that the whole of the coastal area which is fringed by Eastern Ghats consisting mainly of khondalites and charnockites deserves a most careful investigation.

Experimental Work

The black sands as well as white sands were sampled at suitable intervals along the beach. Out of these, six type samples, three black sand concentrates and three white sands, were taken for the present investigation wherein sedimentary petrographic methods have been adopted. They were cleaned of the ferruginous and calcareous coating by acid treatment and repeated washings. They were then dried and subjected to mechanical analysis. They were sieved by I.M.M. sieves of 10, 30, 60, 90, 120 and 150 meshes. All the fractions except the positive fractions of 10, 30 and 60 meshes (which contain little or no heavy minerals) were subjected to heavy mineral separation in Thoulet solution. The heavy crops thus obtained from various mechanical fractions were separated electromagnetically into strongly magnetic and feebly magnetic fractions. The weights of the fractional products were determined at each stage. They were carefully sampled and mounted on slides for optical study and the percentages of occurrence of various minerals were determined with the help of the mechanical stage.

Results

Results for a typical sample of black sand concentrate, are given below:

Sample taken : 1000 gms.

Minerals identified	+ 60 mesh and above (740 gm.)	– 60 to – 150 mesh (260 gm.)		
		Heavy minerals 252 gm.		Light Minerals 8 gm.
		Quantity	Percentage	
		gms.		
Monazite ..	Trace	20	8	Mostly silica and felspars
Magnetite ..	bulk	203	80	
Garnet ..	Small amount	10	4	
Ilmenite ..	do	15	6	
Zircon ..	Trace	2	1	
Sillimanite ..	Small amount	2	1	
Quartz and Felspar ..	The rest	..	..	

Several other samples containing larger percentages of monazite have been analysed and fuller details with comprehensive data will be published in a later communication.

From the above study the minerals recognised in the sands are quartz, felspar, garnet, sillimanite, ilmenite, magnetite, monazite, zircon, rutile, hypersthene, tourmaline and micas. Attention may be drawn to the similarity of the mineral assemblage of this area to that of Travancore beach sands (P. Viswanadhan, 1946). It was found that the mineral species have definite preferential distribution in size in various fractions. Rock fragments are restricted to + 10 mesh fraction; admixture of rock fragments, quartz and felspar, to + 30 mesh fraction; quartz and felspar, to + 60 mesh fraction; garnet and sillimanite to + 90 mesh fraction; and monazite and zircon, to + 120 and + 150 mesh fractions. Magnetite, hypersthene, and ilmenite are found in all the fractions. In general it is found that the samples which have less amount of heavy minerals (white sands) show increasing concentrations of these with decreasing size of the sieve whereas the black sands show decreasing concentration of heavy minerals with the decreasing size of the sieve. The monazite is far more preponderant in the black sand concentrates than in the white sands.

The percentage of mineral assemblage shows a fairly wide variation in different samples but in general, magnetite is most abundant, followed by monazite, garnet, sillimanite, zircon, ilmenite, hypersthene, etc.

Among the minerals, zircon shows well developed prism and pyramid faces, sillimanites are in laths, tourmalines are prismatic, and monazite is well rounded. Monazite grains contain inclusions of which zircon is easily identified. The black sand concentrates contain monazite to about 2% of the bulk and 8% of the – 60 mesh and this is an important result, Detailed investigations are under progress with regard to quantitative estimation of the various mineral assemblages from a larger number of samples as also the chemical composition of monazite and other heavy minerals.

SUMMARY AND CONCLUSION

The beach sands of the Vizagapatam coast between Yarada village and Rushikonda, covering a distance of about ten miles have been taken up for detailed study by sedimentary petrographic methods. Six representative samples from the collection, three of white sands and three of black sands, were subjected to mechanical, heavy mineral, and magnetic separation and the products thus obtained gravimetrically and optically estimated. It is found that of the heavy mineral suite, magnetites are most abundant, followed by monazite, garnet, sillimanite, zircon and ilmenite. At least about 2% of the black sand concentrate consists of monazite. Excluding + 60 mesh material, monazite is found to be 8% of the bulk of black sands. Though the white sands invariably yield monazite, their quantity is proportionately insignificant. Further investigations are in progress.

In conclusion, the authors are grateful to Prof. S. Bhagavantam for his interest in this work, valuable suggestions and for affording facilities in his laboratories for the electromagnetic separation.

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